

1872.

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The Collodio-Bromide Process.



HIS method of Photography, although it has been before the public for many years, having been introduced by Sayce and Bolton, of Liverpool, as long ago as 1864; and although it has so much to recommend it on the score of simplicity of manipulation and excellence of results, has not until recently attracted much attention. Within the last two years, however, it has been the subject of much experiment on the part of various able Photographers, among the principal of whom may be named Messrs. Dawson, Lea, Cooper, and Col. Wortley; and, by their labours, it has been brought to a degree of perfection which, as a Dry Plate Process, leaves scarcely anything to be desired.

The distinguishing features of this process are, the simplicity of the operations connected with the preparation of the plates, their uniformity, excellent keeping qualities, sensitiveness, and the ease with which they may be developed into Negatives, possessing characteristics which will compare favourably with the best of those producible by the Wet Process, when worked under the most favourable conditions. The manipulations are of the simplest character. The plate is cleaned in the usual manner, coated with a preliminary stratum of either Albumen or India Rubber, then with the sensitive Emulsion of Collodio-Bromide; is washed for a longer or shorter time, according to the modification of the process employed, and is then treated with a preservative, dried, and finished by receiving a coat of a non-actinic backing. In this state the plates will retain their sensitiveness for several months, or longer; and if prepared with ordinary care, the obtaining of Negatives of the highest

character with a minimum of exposure may be regarded as an absolute certainty.

There are at present three principal modifications of the Collodio-Bromide Process. Of these, the first in point of sensitiveness, and that for which the highest degree of general efficiency is claimed, is that of Col. Wortley. In this, the Emulsion employed, in addition to a large excess of Nitrate of Silver, contains Nitrate of Uranium. The Uranium is said to confer on the Emulsion a degree of keeping power, and on the plates an immunity from fogging, unattainable by any other means. The plates prepared by Col. Wortley's process are said to be as sensitive as ordinary wet Collodion films, and to give Negatives the printing qualities of which are all that can be desired. The Emulsion also can be used *wet*, it being only necessary to coat the plate, wash until the greasy lines are gone, and expose in the Camera. Col. Wortley's modification of Mr. Lea's Emulsion (in which, in addition to a Bromide, Nitro-Muriatic Acid is used) is also extremely sensitive, and has been found to give excellent results. Mr. Cooper's latest Emulsion, with a Chloride and Lactate, gives very sensitive plates, which are also in other respects most excellent; whilst Mr. Cooper's older Emulsion, with excess of Bromide (directions for working with which were published in our last edition, and are repeated here), although a little slower than either of the others, is yet particularly certain and reliable.

THE EMULSIONS.

THESE may be divided into two classes, viz., those with *excess of Nitrate of Silver*, and those with *excess of Bromide*. Considerable controversy has taken place as to the rival merits of either, but it now seems generally admitted that Emulsions containing excess of Nitrate of Silver are the most sensitive. The *results* obtained by each of the processes are, however, about equally good. Of the Emulsions prepared by the following formulæ, the first three will contain an excess of Nitrate of Silver; the last, an excess of Bromide.

I.

Col. Wortley's Collodio-Bromide Emulsion with Nitrate of Uranium.

The following is the formula published by Col. Wortley:—

Plain Collodion	1 ounce
Pure Anhydrous Bromide of Cadmium	7 grains
Nitrate of Uranium	30 "
Nitrate of Silver	18 "

For summer work the Bromide of Cadmium should be increased to 8 grains, and the Nitrate of Uranium reduced to 20 grains. The Nitrate of Uranium requires to be

prepared for use, by dissolving it in Ether and allowing the water of crystallization to subside. The Ethereal solution is that which is used. Should it not be already acid, it must be made so by the addition of a minim or two of Nitric or Acetic Acid to each ounce of the solution.

2.

*Col. Wortley's modification of Mr. Lea's Collodio-Bromide Emulsion
with Nitro-hydrochloric Acid.*

THE PLAIN COLLODION.

Pure Sulphuric Ether.....	1 ounce
Alcohol '805	1 , ,
Pyroxylene.....	20 grains

When required for use, this must be thinned with Ether, in the proportion of 5 parts Collodion to 6 parts Ether, the quantity of Ether being varied slightly, according to the size of the plate. To $5\frac{3}{4}$ ounces of the thinned Collodion add $4\frac{1}{2}$ drachms of a solution of Bromide of Cadmium (of the strength of 1 drachm Bromide of Cadmium to 1 ounce Alcohol), and 9 minimis of strong Nitro-hydrochloric Acid.

THE EMULSION.

Bromised and Acidified Collodion prepared as above	1 ounce
Nitrate of Silver, powdered.....	16 grains
Dissolved by the aid of heat in Alcohol '825 s.g.	3 drachms

3.

Mr. Henry Cooper's Collodio-Bromide Emulsion with a Chloride and Lactate.

THE COLLODION.

Anhydrous Bromide of Cadmium	30 grains
Bromide of Ammonium.....	15 , ,
Anhydrous Chloride of Calcium	7 to 10 , ,
Alcohol '805	2 ounces
Ether	5 , ,
Powdery Pyroxylene.....	50 or 60 grains

THE EMULSION.

Collodion prepared as above	7 drachms
Nitrate of Silver, powdered.....	15 grains
Dissolved by the aid of heat, and 8 minimis of Distilled Water, in absolute Alcohol	3 drachms
Syrupy Lactate of Ammonia	3 drops

4.

Mr. Henry Cooper's Collodio-Bromide Emulsion, with excess of Bromide.

THE COLLODION.

Anhydrous Bromide of Cadmium	40 grains
Bromide of Ammonium	20 , ,
Alcohol '805	3 ounces
Ether '730	5 , ,
Powdery Pyroxylene.....	50 to 60 grains

THE EMULSION.

Collodion prepared as above	x ounce
Nitrate of Silver	xx grains
Dissolved by the aid of heat, and an equal weight of Distilled Water in Alcohol '805.....	$\frac{1}{2}$ ounce

In preparing the Emulsions, the Alcoholic solution of Nitrate of Silver should be added to the Collodion in small portions at a time, shaking well between each addition.

The above formulæ have been given, both to show the relative composition of the different Emulsions, and also to enable those who may wish to do so to prepare them for themselves. It is, however, recommended in all cases to purchase the Emulsions ready prepared. The difficulties attending the preparation of Collodion to fulfil any special purpose, are too well known to the experienced to need any comment ; and to the attempts by amateurs to manufacture it for themselves, may be traced most of the failures and difficulties of those who have been disappointed in obtaining with the process the success they had anticipated.

The materials for each of the above Emulsions are supplied by *Mawson and Swan* in the form of two solutions—Collodion and Sensitizer—which only require to be mixed to form the Emulsion. (*See end.*)

In all operations with the Sensitive Emulsions, whether in preparing plates or in developing the prepared plates, the greatest care must be taken to guard against the access of actinic light. Attention to this point is of even greater importance than in the ordinary Wet Process, Bromide of Silver being particularly sensitive, even to the weakest radiations of light, and neglect of such precaution is certain to entail regular and unvarying fog. The window of the dark room should admit only a full orange light ; and, in using a gas or candle flame, it should be protected with orange glass, provision also being made for preventing the reflection of the light from the ceiling or walls of the room. The Collodion and Sensitizer should be kept in a dark place ; and the Sensitive Emulsion, when not in use, should be kept in the dark—not in the dark room, but in a place from which all light is excluded.

The manner of mixing the Emulsions according to either of the above formulæ is precisely the same in each case. A bottle, which must be perfectly clean and dry, is selected, of about double the capacity of the quantity of Emulsion it is intended to prepare. In it is placed the requisite quantity of the Collodion, and the proper amount of Sensitizer is added in small portions at a time, shaking well between each addition. In about twelve hours the Emulsion will be fit for use. They all gradually increase in sensitiveness for a few days, and will then remain unaltered for a considerable

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A NEW TRANSPARENT FILM.

READ BY F. C. BEACH, P.S.A.P.N.Y.,

BEFORE THE SOCIETY OF AMATEUR PHOTOGRAPHERS OF NEW YORK
IN FEBRUARY, 1888.

WITHIN the last three years numerous efforts have been made to furnish to the photographic world several substitutes for glass as a support for the sensitive film intended to be equally as good, extremely light, and non-breakable.

We have seen paper made translucent with castor oil extensively used; but the messy and troublesome manipulation over-balanced its other desirable qualities. Succeeding this has been introduced the double film, on a paper support, by means of which the negative film can be removed and transferred from the paper to glass or a gelatine skin after development and fixing.

Thus, though the manipulation requires more practical experience than when ordinary paper is used, a flexible film perfectly transparent, free from grain, and equal to glass, is obtained.

It would seem that the additional operation of separating the sensitised film from the paper support and attaching it to a transparent film or skin of tough gelatine might be avoided by coating the gelatine skin itself with the sensitive emulsion. I presume, however, this has been thought of, but rejected on the ground that paper as a support is perhaps more pliable and more easily coated. At any rate, the transfer process seems to me too complicated for the average amateur to easily master, and one which it would not be advisable to employ, unless a long journey in a foreign country is to be undertaken, when it is necessary to carry and have on hand a large supply of material, having the least possible weight. What is wanted is support for the sensitive film, which shall be as light as paper, transparent as glass, resisting the action of water and other acids and alkalis like glass, and capable of retaining its original size and shape throughout the necessary manipulations.

Then, when the negative is developed and fixed, it is precisely as if on glass, transparent, quick printing, and non-breakable; all after transferring operations being unnecessary.

A step in this direction was the Woodbury film, which I exhibited before this Society a little over a year ago. The support employed was a special thin paper treated with a resinous substance to make it transparent, and coated on both sides with gelatine sensitive emulsion. The film was quite delicate when wet, and easily torn. When dry, it presented a peculiar crinkled or wrinkled appearance, which was not altogether satisfactory.

Last fall, a new transparent film based on the invention of Francis H. Froedman, a chemist, of Dublin, Ireland, was introduced, and is now supplied by the Vergara Film Company, of London. This is the film which I wish to exhibit and explain to you to-night, samples of which were kindly sent to me by the Company. The film is patented in England, but not in this country, so far as I have been able to learn; hence, there is no reason why it cannot be made successfully here.

It is perfectly smooth and flat, and looks very much like a thin glass plate. It is not affected by hot or cold water, and is insoluble in dilute acids and alkalies. The patent is dated May 3, 1887.

From the foregoing description, it will be seen that the film is virtually nothing more than an insoluble gelatine skin, rendered nearly colourless by sulphurous acid, coated with a sensitive emulsion.

From a few experiments I have made with the film, I am convinced that it can be treated just as easy and certain as glass, and is much better than paper, because it is quite tough, like leather, and will not tear. I have discovered that very cold weather causes the film to curl some on the emulsion coated side, while in a temperature of 60° or 70° F. it will flatten out nearly straight. I use the film on an ordinary Eastman carrier, which clamps the edges down flat. It may be slid in an ordinary plateholder with a thin plate at the back. But the special carrier is the best.

The sensitiveness of the film is governed by the sensitiveness of the emulsion put on it. In making a test with Warnerke's sensitometer, using a strong potash developer, I find the highest number registered is 17, while a Cramer 40 plate registers 22. Both were developed at the same time in the same developer for five minutes. The highest numbers can be seen by holding the plate or film over a piece of white paper. Cramer's plate is, therefore, ahead on sensitiveness.

The development of an exposed film is very simple, and is carried on precisely like a plate. The film should first be soaked in water not colder than 60° F., for perhaps two minutes, until it lies flat. If the water is very cold the corners and edges will at first curl upward a little. Then the water is drained off and the developer applied. That recommended is the pyro and ammonia developer, but I find the potash developer based on my formula works excellently. On the sample films I have brought, I employed three grains of pyro to the ounce, and six grains of potash. The development proceeds gradually, is under perfect control, and the film in the wet state

can be easily removed and examined by transmitted light. The patented tray exhibited before the Society a short time ago, in which the film could be clamped to form its bottom, would work excellently, since the tray acts as a frame to hold the film.

After development, which usually takes about as long as a plate, the film is removed from the tray by taking hold of one corner and sliding it out on a glass plate; it is then held under the tap and washed for a minute, removed from the plate, and placed picture side upwards in the hypo bath, which should not be too cold (strength, 1 oz. to 4 oz. of water); it fixes out in a few minutes, is then washed for half an hour by soaking in three or four changes of water. Unless the film is completely fixed and well washed it will dry out with a slight yellow tinge. My first experiment in drying the film was to place it, while damp and limp, picture side upwards, on a glass plate; then I set the latter in the drying rack. In the morning the film had fallen off, and was somewhat buckled up. But the rapidity of drying, as recommended by a special process, is one of the excellent points which I will demonstrate at the close of this paper.

Removing the limp and leather-like negative from the wash water, slightly draining off the surplus water, you simply put it in a tray and pour over it an ounce, or less, of common alcohol, and let it soak for fifteen minutes. Before the end of that time you will notice that the film becomes quite rigid. After soaking in alcohol I place the film between two sheets of clean blotting-paper, and bend them around a paper cylinder, such as is used for mailing purposes, not less than three inches in diameter, so that the coated side of the film will be outward, and clamp the paper to the cylinder by two or three elastic bands. If the film is removed from the alcohol before the time specified, it will stick in places to the blotting-paper.

If kept in a draft of warm, dry air from five to fifteen minutes, the film will become perfectly hard and dry, retaining, of course, the curve of the cylinder; but when put in a printing frame under pressure it is made quite flat, and as smooth and even as a glass plate.

The buckled film negative spoken of I treated in this way, wetting it first until it was limp, soaking in alcohol, and then bending it around the cylinder; it dried perfectly flat and smooth. Fresh alcohol should be used for each separate film.

There appears to be no better way to dry the film smooth. I tried squeezing it face downwards on a sheet of vulcanised rubber, but when dry it shrunk and buckled up unevenly, as you will see by the specimen I have brought. If the film is suspended from two corners on a line to drain and dry, it will take an hour or more, but it will curl inward around the edges. This may be overcome somewhat by soaking the film in water containing a small percentage of glycerine previous to drying. It is also a good plan when the film is surface dry to place it between sheets of blotting-paper,

putting the latter in a printing frame; the pressure of the spring will cause the film to dry flat. The film does not frill, and there is no danger of the sensitive film slipping off as it sometimes does on glass plates.

It has been said that the film is adapted for photogravure purposes, because it can be printed from on either side. I estimate it to be about $\frac{1}{4}$ of an inch thick, and find when it is printed from on the wrong side there is a slight blur. Still there is no reason why the film may not be made sufficiently thin to be used from either side. The picture on the film may be as readily intensified or reduced as on glass.

The manifest advantages of this film to the tourist are that it supplies all the good qualities of glass and paper, with none of their drawbacks; being as light as paper, large quantities can be carried in a small space.

I submit for your inspection five $2\frac{3}{4}$ inch square negatives made by contact from transparencies, and a strip of a part of an original negative made on a film not backed with collodion, accompanying all with a silver print. These were sent to me by the Company as specimens. I also have two or three 4 by 5 negatives made by myself, one exposed instantaneously with Hoover shutter, Ross lens, $7\frac{1}{2}$ inch focus, f/ $\frac{8}{5}$ stop; another time exposure same lens f/ $\frac{1}{40}$, three seconds, very cloudy at time, and an over-exposed negative having the peculiar buckling appearance obtained by drying on rubber. I also have a transparency made by contact from one of these negatives, developed with oxalate of potash and iron; also a sample of the film, a portion of which was dipped in hot water to dissolve off the sensitive film. You will notice the remarkable transparency of the shadows in all.

Thanking you for your attention, I close with the hope that a film equally as good may yet be produced in this country by some of our energetic manufacturers.



time. Before each time of using, the Emulsion should be well shaken, allowed to stand for three or four hours, and then as much as is required for use should be filtered. This is best done through prepared Tow in a close Collodion Filter (*see end*), but in lieu of this it may be passed through a piece of moderately fine linen. The linen for this purpose must be carefully washed (the final rinse being in Distilled Water, if possible), and dried before use.

COATING THE PLATES.

THE plates will require a substratum of some kind previous to being coated with the Emulsion. For this purpose, either Dilute Albumen, or India Rubber may be used. Dilute Albumen on the whole is best; but some operators prefer a solution of India Rubber in Chloroform. The film of India Rubber has, however, the disadvantage of occasionally assuming a repellent condition, which prevents the even flow of the Emulsion on the plate. This may be obviated by warming the plate when about to be used, and coating it as soon as cold. The Dilute Albumen may be prepared, by mixing one ounce of *Mawson and Swan's prepared Albumen* (*see end*) with eight ounces of water, or by diluting the white of one egg with sixty or eighty ounces of water. To prepare the solution of India Rubber, dissolve one grain of India Rubber in a fluid ounce of Chloroform. (*See end.*) The Albumenized plate is to be coated with the Emulsion in the same manner as with ordinary Collodion. Plates coated with Emulsions Nos. 1, 2, and 3 are, as soon as the film is set, to be plunged into a dish or an ordinary dipping-bath of water (Distilled preferably), and there agitated until the greasy lines disappear, and the water flows smoothly over the film; they are then to be rinsed in a second vessel of water. Plates prepared with Emulsion No. 4, must be washed in two changes of water, and then soaked in a good bulk of water for an hour. With less washing they will not be so sensitive. Much depends on the quality of the water employed. Distilled water should be used if possible, or, failing it, boiled and filtered. Rain Water may be substituted. After washing, the plates must be allowed to drain, and then be transferred to the Preservative Solution.

THE PRESERVATIVE.

MUCH of the sensitiveness and other qualities of the plates depends upon the Preservative employed. Tannin and Gallic Acid, alone or together, and in combination with Gum Arabic and Sugar, have been found to give excellent results. Pyrogallic Acid, with Gum and Sugar, is highly recom-

mended by Mr. M. C. Lea, and has also been much approved of by other workers. Tannin tends to preserve the gradation of half-tone, and Gallic Acid to give detail in the shadows. Gum Arabic, except in small quantity, is apt to give rise to blisters. Lately, Salicine has been proposed by Colonel Wortley as a substitute for Gum Arabic, and is said to be equally efficient, whilst free from the disadvantage of causing blisters.

I.

Col. Wortley's Preservative for his Collodio-Bromide Emulsion with Nitrate of Uranium No. 1.

Tannin	10 grains
Gum Arabic	6 "
White Sugar	4 "
Distilled Water	1 ounce

Dissolve, filter, and to each ounce add one drachm of the following solution—

Gallic Acid	24 grains
Alcohol	1 ounce

and filter again. The plate may remain in this Preservative Bath while another plate is being coated and washed.

2.

Mr. M. C. Lea's Pyrogallic Acid Preservative, recommended by Colonel Wortley for use with Emulsion No. 2.

Gum Arabic	60 grains
White Sugar	60 "
Pyrogallic Acid	2½ "
Distilled Water	6 ounces

The Pyrogallic Acid should be added only immediately before use. The solution must be filtered. The plate may remain in the Preservative for about four minutes.

3.

Mr. M. C. Lea's Cochineal Preservative, for use with Emulsion No. 2.

Take of Cochineal one ounce and a half, Fuming Sulphuric Acid one ounce, grind together in a mortar, adding more Acid by degrees, until two fluid ounces have been used. Transfer to a wide-mouth bottle, which close and set in hot water. When cool set aside for a week ; then mix with about one pint and a half of Water. Add slackened Lime, or Milk of Lime, until the liquid gives an Alkaline reaction with Litmus Paper. Filter, and pour water upon the filter, until the filtrate amounts to eighty ounces.

Take of the above Solution	1 drachm
Distilled Water	7 drachms
Gum Arabic	10 grains
White Sugar	10 "

Filter the solution. Allow the plates to remain in this Preservative for from five to ten minutes.

With regard to this preparation it may be remarked, that the Cochineal solution is likely to be much better made by the practical chemist than by the amateur. (See end.)

This preparation gives exquisite sensitiveness, with great softness and delicacy in the Negative.

4.

Mr. H. Cooper's Preservative, for use with Emulsion No. 3.

Tannin	5 to 6 grains
Gallic Acid	2 "
White Sugar	5 "
Gum Arabic	5 "
Distilled Water.....	1 ounce

Filter the solution. Soak the plate in this for about three minutes. A mixture of seven parts of this Preservative with one part of the Cochineal Preservative (No. 3) is slightly more sensitive, and works well.

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Mr. H. Cooper's Preservative, for use with Emulsion No. 4.

Gallic Acid	12 grains
Gum Arabic	60 "
White Sugar	20 "
Distilled Water	4 ounces

Filter the solution. The plate must be soaked in this for five minutes.

In every case the Preservative should be freshly prepared when required for use.

After being removed from the Preservative, the plate must be set up to drain, and when sufficiently dry, it must be coated at the back with an orange-colour backing. This is necessary with Collodio-Bromide plates, in order to prevent blurring.

THE BACKING.

MAWSON AND SWAN'S *Adiactinic Backing*, is the cleanest and most readily applied backing for Dry Plates. It is applied in the same manner as Collodion, and dries immediately. Where this is not employed, the following may be used:—Dissolve 200 grains of Dextrine in half an ounce of water; add Glycerine 20 drops, Carbolic Acid 1 drop; then mix well with 1000 grains of *Moist Burnt Sienna*, ground in water. Apply with a flat camel-hair brush.

The plates having been backed, must now be finished by being made thoroughly dry by the aid of heat. For this purpose, Mawson and Swan can recommend *Mr. Gough's Drying Box* (*see end*), which is at once simple and effectual. The plates are now ready to be stored away until required for use, and should be kept in a dry place. Should they get at all damp, they must be dried previous to development, otherwise blisters are certain to form if an *Albumen substratum* has been used.

EXPOSURE.

THE amount of exposure required for plates prepared with the Emulsions, Nos. 1, 2, and 3, will be about the same as for an ordinary wet plate. The plates prepared with Emulsion No. 4 require a longer exposure, but sometimes they are nearly as sensitive as wet plates. When the light is at all feeble, it is better in each case to expose a little longer than to risk the plate being underexposed. Collodio-Bromide plates possess this advantage, that all of a batch being nearly equal in sensitiveness, the exposure required for one affords a clue to that necessary for each of the others exposed under similar circumstances.

DEVELOPMENT.

THE Alkaline method of development, with Pyrogallic Acid, Ammonia, and a Bromide, is that which is used in this process ; and it possesses one great advantage compared with ordinary development in the wet process, in that it is very much more under the control of the operator. The Pyrogallic Acid and Ammonia are the developing agents proper, the Bromide acting as a restrainer ; and by judiciously varying the proportions of the Bromide and Ammonia in the developer, a very wide range is allowable, both as regards subject and time of exposure. For instance, if two plates prepared in the same manner, are exposed under similar circumstances, the one for double the length of time that the other is, and if the proportion of Bromide contained in the developer used for the second plate is treble that which is used in the developer for the first, the Negatives will be as nearly as possible alike ; whereas, *were the developers reversed, both plates would be spoiled* ; the large amount of Bromide in the second developer would prevent the bringing out of detail in the darker parts of the image on the first plate ; whilst there would not be enough Bromide in the first developer to prevent fogging, with the exposure the second plate had received. In winter, or where the light is poor, but a small quantity of Bromide is required. On the contrary, with a brilliant light, or in hot

weather, an increased proportion must be used. A little practice will soon enable the operator to adjust the proportions of Bromide and Ammonia, to the subject and the amount of exposure the plate has received. The proportions given below for mixing the developer, are those best adapted to average work. The Pyrogallic Acid should always be used in the same proportion, the Bromide and Ammonia alone being varied according to circumstances. Plates that have had a fair exposure in good light, can be developed quickly, and will not usually require re-developing. Plates that have had a short exposure, require to be slowly and patiently developed in order to attain the best results. Should a plate fog, it will arise either from extraneous light having in some way reached the plate, from over exposure, or from the use of too little Bromide in the developer. On the contrary, should the shadows be clear, and deficient in detail, either the plate has been under-exposed, or too much Bromide has been used in the developer.

The following solutions will be required :—

P. Pyrogallic Acid	60 grains
Alcohol	1 ounce
A. Carbonate of Ammonia	60 grains
Distilled Water	1 ounce
B. Bromide of Potassium	12 grains
Distilled Water	1 ounce

Before commencing to develope a plate, the backing must be removed by rubbing it with a piece of flannel or sponge which has been wetted and wrung out. The film must then be flooded with a mixture of equal parts of Alcohol (Methylated will do) and Water, and afterwards washed until the greasy lines disappear. It is now ready for the application of the developer. A plate $6\frac{1}{4} \times 3\frac{1}{4}$ in. will require about one ounce of developer. For larger or smaller plates the quantity mixed at a time must be proportionately increased or diminished. Mix—Distilled Water, 1 ounce, Sol. P, 30 drops; cover the plate with the mixture, and allow it to remain on for a minute or two, so that the film may be thoroughly permeated ; then return it to the developing glass, add to it Sol. A, 10 drops, Sol. B, 3 drops, again return it to the film, and continue to pour on and off the plate until the development is completed, adding more of Sol. A or Sol. B, or of both, as the progress of the development may seem to indicate.

In developing plates prepared with the *Bromo-Uranic Emulsion* (No. 1), Col. Wortley prefers to use a portion of Alcohol, and also larger quantities of Ammonia and Bromide in the developer. The proportions

he recommends are—Alcohol, 2 drs., Water, 5 drs., Sol. P, 30 drops, Sol. A, 35 drops; Sol. B, 10 drops. The Alcohol, Water, and Sol. P, are to be mixed and the film covered with the solution. After remaining on the film for a minute or two, the solution is returned to the developing glass, the Sol. A and Sol. B is added, it is then again returned to the film, and the development is proceeded with. If the exposure has been well timed, in about a minute the picture will appear. Should the image be slow in acquiring detail and intensity, thirty-five drops of Solution A and ten drops of Solution B, must be added to the developer and the development continued. Where the picture has been taken in a weak light, it is often necessary to continue the addition of Solutions A and B to the developer, care always being taken to add the proper proportion of Sol. B, except the plate seems very clear and devoid of detail, when a few drops of Solution A alone may be added. It is also recommended, when a plate has been under-exposed or the subject badly lit, to throw away the first developer when it seems to have exhausted its action, and to substitute for it a fresh one, prepared with Alcohol, 5 drs., Water, 2 drs., Sol. P, 60 drops, Sol. A, 30 drops, Sol. B, 10 drops, and to continue the development, adding Solution A freely, with the proper proportion of Solution B, until the development is finished.

It will greatly assist the development of detail in any very dark part of the picture if the developer is kept pouring on and off that particular part. It is also frequently useful in the course of development, to allow the plate to remain without the developer on it for a minute or two at a time, this treatment greatly assisting both to bring out detail and to give density.

Plates prepared with Emulsions Nos. 1, 2, and 3 usually acquire sufficient density by the Alkaline development alone; and the development may be pushed to a very considerable extent without any risk of fog. In developing plates prepared with Emulsion No. 4, however, it is best, as soon as the detail of the image is well out, to wash off the developer, and give the necessary density by intensifying with Pyrogallic Acid and Nitrate of Silver in the usual manner; in fact, this is the best course to adopt with *all the Emulsions* when there is any difficulty in obtaining density. Forcing the development is attended with risk of fog, and in addition the process is sometimes very tedious.

INTENSIFYING.

THIS can be done either before or after fixing, and by any of the ordinary methods. The following answers well:—

SOL. NO. 1.

Citric Acid	25 grains
Pyrogallic Acid	10 "
Distilled Water	2 ounces

SOL. NO. 2.

Nitrate of Silver	10 grains
Distilled Water	2 ounces

Wash the plate well; then in a measure or developing-glass take rather more of Sol. No. 1 than is sufficient to cover the plate, pour this on and off the plate a few times in order to insure the thorough neutralization of the Alkali, return it to the measure, add to it an equal quantity of Sol. No. 2, and continue to pour on and off the plate until sufficient density is attained. Care must be taken not to over-intensify. Beginners are apt to err in this respect, from overlooking the influence which the colour has upon the printing qualities of the Negative.

FIXING.

EITHER of the following solutions can be used, but the Hyposulphite is to be preferred.

I.

Hypsulphite of Soda	1 ounce
Water	8 ounces

2.

Cyanide of Potassium	20 grains
Water	1 ounce

VARNISHING.

THIS, the final process with the finished picture, cannot be better performed than with *Mawson and Swan's Extra Hard Varnish*, which the proprietors here take the opportunity of recommending, not only for this special purpose, but for Negatives of every description. It is easily applied, dries bright with very little heat, is not easily scratched, does not stick in printing, and affords the best and most efficient protection to the Negative.

THE COLLODIO-BROMIDE PROCESS AS A SUBSTITUTE FOR THE ORDINARY WET PROCESS.

MUCH has lately been written, and hopes have been entertained, of the possibility of the Collodio-Bromide Process replacing the ordinary Negative Process with the Bath. In its present form, however, although all that can be desired as a Dry Process, yet, for portraiture and the ordinary

work of the Studio, it lacks those qualities of extreme simplicity and facility of working, which deservedly makes the Wet Process so great a favourite. In point of economy also, both of time and material, the Collodio-Bromide Process is inferior to the Wet Process.

The principal disadvantages of the Collodio-Bromide Process, as compared with the ordinary Wet Collodion Process are, the necessity for a substratum for the sensitive film; for a backing to prevent blurring; and for the use of Alkaline development, which demands on the part of the operator, both more skill and patience than is necessary in the ordinary Wet Process with an Iron developer.

For the guidance of those who may wish to try the process *wet*, it may be mentioned that the Emulsion No. 1 (Col. Wortley's, with Uranium) is the one best adapted to the purpose. The plates are prepared with a substratum, then coated with the Emulsion, and may be at once exposed in the Camera. *Before development*, the plates must be washed until the greasy lines disappear; it is immaterial, however, whether this is done before or after *exposure*. If the plates are to be kept long after being coated, the washing should be done as soon as the film has set. When about to develop, if the edges of the plate seem at all dry, the plate must be flushed with water in order to cause the developer to flow freely over it. The exposure should be about the same as for a good wet plate. No preliminary treatment of the film is required, and no Alcohol, and rather more Pyrogallic Acid, and less Ammonia than for dry plates, is used in the developer.

The following developer may be employed :—

Water	x ounce
Sol. P, page 11	45 drops
Sol. A "	40 "
Sol. B "	10 "

This is poured at once on the plate, and the development is conducted in the same manner as for Dry Plates. Should the subject contain any very strong contrasts, the use of a coloured backing to the plate will be necessary.



MAWSON & SWAN,

MAWSON AND SWAN'S PRICE LIST
OF
PURE CHEMICALS, &c.,
FOR
THE COLLODIO-BROMIDE PROCESS.
(Subject to the fluctuations of the Market.)

		per oz.	per lb.
		s. d.	s. d.
Plain Collodion, for preparing Collodio-Bromide Emulsions, Thinning Solution for reducing Thick Collodion	half-pints, 6/6 ; pints, 12/6	... 0 6	6 0
Ether, Pure	.	0 6	7 6
", Methylated	.	0 3	3 0
Alcohol, Absolute	.	0 6	6 0
", Pure, '830 s.g.	.	0 3	3 6
", Methylated	6/- per gallon	0 1	1 0
Pyroxylene, specially prepared for the Collodio-Bromide process	2 0	...	
Cadmium Bromide, Pure Anhydrous	.	2 6	...
Calcium Chloride, Pure Anhydrous	.	0 2	1 6
Ammonium Bromide, Pure	.	1 6	...
Uranium Nitrate, Pure	.	2 6	...
Nitro-hydrochloric Acid, Strong	.	0 3	...
Ammonia Lactate (syrupy)	.	2 6	...
Nitrate of Silver, Pure Neutral, in fine powder Ordinary	.	4 6	...
Solution of India Rubber in Chloroform	.	4 0	...
Sienna Backing for Dry Plates	1/- per bottle	0 6	...
Tannic Acid, Pure	.	0 9	...
Gallic Acid, Pure	.	1 0	...
Sugar, Pure	.	0 1	1 0
Gum Arabic, selected, White	.	0 4	4 6
Salicine, Pure	.	2 6	...
Materials for Preservative, packets containing sufficient to prepare 5 oz., 2d. each, 2/- per doz.
Lea's Cochineal Preservative (concentrated, 1 to 4)	.	0 2	2 0
Pyrogallic Acid, Pure	.	3 6	...
Carbonate of Ammonia, Pure	.	0 2	1 6
Bromide of Potassium, Pure	.	1 0	...
Citric Acid, Pure	.	0 4	4 0
Hypsulphite of Soda	14 lbs., 3/6	0 1	0 4
Cyanide of Potassium	.	0 3	3 6
Distilled Water	6d. per gallon.	...	
Collodion Filters, for filtering Collodion without loss by evaporation, each	6/6	...	
Prepared Tow, for filtering Collodion, &c.	.	0 2	2 0
The Improved Dropping Bottle	each, 2 oz., 1/- ; 4 oz., 1/6	...	
Gough's Drying Box	

Set of Materials for testing the Collodio-Bromide Process, 10/6.

Mawson & Swan's Illustrated Price List, embracing every Requisite for the practice
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Mawson & Swan's PHOTOGRAPHIC SPECIALTIES.

MAWSON'S ORIGINAL STANDARD COLLODION FOR IRON DEVELOPMENT

Was the first produced specially for Iron development, and is more widely known and extensively used than any other Collodion. Its distinguishing features are, extreme sensitiveness, strength and smoothness of film, stability, uniformity in quality, and the readiness with which it yields Negatives combining brilliancy with delicacy of gradation.

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Enamel Collodion, for giving a glass-like surface to Photographs. Half-pints, 2/9 ; pints, 5/-

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For Mounting Photographs, Prints, Drawings, etc.

Is very superior to Starch, or any of the substances usually employed in mounting. It is quite free from the defect of causing warping or buckling of the mount, and does not impair the gloss of Prints on Albumenized Paper. 1/- per bottle.

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